

What is claimed is:

1 1. A panel display apparatus for displaying an image in a
2 Subj A discharge sustain period, comprising:

3 a gas discharge panel in which a plurality of discharge cells
4 are arranged in the form of matrix between a pair of substrates;
5 and

6 a driving circuit which applies a write pulse to selected
7 discharge cells of the plurality of discharge cells to write the
8 image, and applies at least one sustain pulse to each of the
9 plurality of discharge cells to perform a sustain discharge in
10 the selected discharge cells,

11 wherein a pulse waveform of each sustain pulse is determined
12 so that a particular current waveform is formed when the sustain
13 pulse is applied, the particular current waveform being a
14 waveform in which a time from when a peak is reached to when a fall
15 is completed is no more than triple a time from when a rise
16 is started to when the peak is reached.

1 2. A panel display apparatus for displaying an image in a
2 discharge sustain period, comprising:

3 a gas discharge panel in which a plurality of discharge cells
4 are arranged in the form of matrix between a pair of substrates;
5 and

6 a driving circuit which applies a write pulse to selected
7 discharge cells of the plurality of discharge cells to write the
8 image, and applies at least one sustain pulse to each of the
9 plurality of discharge cells to perform a sustain discharge in
10 the selected discharge cells,

11 wherein immediately before a leading edge of each sustain
12 pulse which is applied to the discharge cell, the driving circuit
13 applies a pulse that is opposite in polarity to the sustain
14 pulse, to the discharge cell for a predetermined period.

3. The panel display apparatus of Claim 2,
wherein an absolute value of a voltage of the pulse that is
opposite in polarity to the sustain pulse is no smaller than an
absolute value of a voltage of the sustain pulse.

4. The panel display apparatus of Claim 3,
wherein a time during which the absolute value of the voltage
of the pulse is no smaller than the absolute value of the voltage
of the sustain pulse is no more than 100ns.

5. The panel display apparatus of Claim 3,
wherein a time during which the absolute value of the voltage
of the pulse is no smaller than the absolute value of the voltage

4. of the sustain pulse is no more than 50ns.

1. 6. The panel display apparatus of Claim 2,

2. wherein an absolute value of a voltage of the pulse that is
3. opposite in polarity to the sustain pulse is no smaller than 1.5
4. times an absolute value of a voltage of the sustain pulse.

1. 7. A panel display apparatus for displaying an image in a
2. discharge sustain period, comprising:

3. a gas discharge panel in which a plurality of discharge cells
4. are arranged in the form of matrix between a pair of substrates;
5. and

6. a driving circuit which (a) applies a write pulse to selected
7. discharge cells of the plurality of discharge cells to write the
8. image, and (b) successively applies a plurality of sustain pulses
9. which alternate in polarity, to each of the plurality of
10. discharge cells to perform a sustain discharge in the selected
11. discharge cells,

12. wherein immediately before a leading edge of at least a
13. sustain pulse of the plurality of sustain pulses which is first
14. applied to the discharge cell, the driving circuit applies a
15. pulse that is opposite in polarity to the sustain pulse, to the
16. discharge cell for a predetermined period.

1 8. The panel display apparatus of Claim 7,
2 wherein an absolute value of a voltage of the pulse that is
3 opposite in polarity to the sustain pulse is no smaller than an
4 absolute value of a voltage of the sustain pulse.

1 9. The panel display apparatus of Claim 8,
2 wherein a time during which the absolute value of the voltage
3 of the pulse is no smaller than the absolute value of the voltage
4 of the sustain pulse is no more than 100ns.

1 10. The panel display apparatus of Claim 8,
2 wherein a time during which the absolute value of the voltage
3 of the pulse is no smaller than the absolute value of the voltage
4 of the sustain pulse is no more than 50ns.

1 11. The panel display apparatus of Claim 7,
2 wherein an absolute value of a voltage of the pulse that is
3 opposite in polarity to the sustain pulse is no smaller than 1.5
4 times an absolute value of a voltage of the sustain pulse.

1 12. A panel display apparatus comprising:
2 a gas discharge panel in which a plurality of pairs of first

3 and second electrodes covered with a dielectric are arranged
4 between a pair of substrates; and

5 a driving circuit which accumulates a wall charge on the
6 dielectric to write an image, and applies at least one sustain
7 pulse between each pair of first and second electrodes to perform
8 a sustain discharge in areas where the wall charge has been
9 accumulated,

10 wherein immediately before a leading edge of each sustain
11 pulse which is applied between the pair of first and second
12 electrodes, the driving circuit applies a pulse that is opposite
13 in polarity to the sustain pulse, between the pair of first and
14 second electrodes for a predetermined period.

15 13. The panel display apparatus of Claim 12,

16 wherein the driving circuit applies the pulse of the opposite
17 polarity and the sustain pulse between the pair of first and
18 second electrodes, by applying two rectangular pulses that are
19 opposite in polarity, respectively to the first electrode and the
20 second electrode.

21 14. A panel display apparatus comprising:

22 a gas discharge panel in which a plurality of pairs of first
23 and second electrodes covered with a dielectric are arranged

4 between a pair of substrates; and

5 a driving circuit which (a) accumulates a wall charge on the
6 dielectric to write an image, and (b) successively applies a
7 plurality of sustain pulses which alternate in polarity, between
8 each pair of first and second electrodes to perform a sustain
9 discharge in areas where the wall charge has been accumulated,

10 wherein immediately before a leading edge of at least a
11 sustain pulse of the plurality of sustain pulses which is first
12 applied between the pair of first and second electrodes, the
13 driving circuit applies a pulse that is opposite in polarity to
14 the sustain pulse, between the pair of first and second
15 electrodes for a predetermined period.

16 15. A panel display apparatus for displaying an image in a
17 discharge sustain period, comprising:

18 a gas discharge panel in which a plurality of discharge cells
19 are arranged in the form of matrix between a pair of substrates;
20 and

21 a driving circuit which applies a write pulse to selected
22 discharge cells of the plurality of discharge cells to write the
23 image, and applies at least one sustain pulse to each of the
24 plurality of discharge cells to perform a sustain discharge in
25 the selected discharge cells,

11 wherein an absolute value of a voltage of each sustain pulse
12 which is applied to the discharge cell is higher during a first
13 period than a second period, the first period being a fixed
14 period from a leading edge of the sustain pulse, and the second
15 period being a period from a lapse of the fixed period to a
16 trailing edge of the sustain pulse.

1 16. The panel display apparatus of Claim 15,
2 wherein a highest absolute value of the voltage of the
3 sustain pulse in the first period exceeds an absolute value of a
4 discharge firing voltage of the discharge cell, and
5 the absolute value of the voltage of the sustain pulse in the
6 second period is below the absolute value of the discharge firing
7 voltage of the discharge cell.

1 17. The panel display apparatus of Claim 16,
2 wherein a time during which the absolute value of the voltage
3 of the sustain pulse exceeds the absolute value of the discharge
4 firing voltage is no more than 100ns.

1 18. The panel display apparatus of Claim 15,
2 wherein immediately after the trailing edge of the sustain
3 pulse, the driving circuit applies a pulse that is opposite in

4 polarity to the sustain pulse, to the discharge cell for a
5 predetermined period.

1 19. A panel display apparatus comprising:
2 a gas discharge panel in which a plurality of discharge cells
3 are arranged between a pair of substrates; and
4 a driving circuit which (a) applies a write pulse to selected
5 discharge cells of the plurality of discharge cells to write an
6 image, and (b) successively applies a plurality of sustain pulses
7 which alternate in polarity, to each of the plurality of
8 discharge cells to perform a sustain discharge in the selected
9 discharge cells,

10 wherein an absolute value of a voltage of at least a sustain
11 pulse of the plurality of sustain pulses which is first applied
12 to the discharge cell is higher during a first period than a
13 second period, the first period being a fixed period from a
14 leading edge of the sustain pulse, and the second period being a
15 period from a lapse of the fixed period to a trailing edge of the
16 sustain pulse.

1 20. The panel display apparatus of Claim 19,
2 wherein a highest absolute value of the voltage of the
3 sustain pulse in the first period exceeds an absolute value of a

4 discharge firing voltage of the discharge cell, and
5 the absolute value of the voltage of the sustain pulse in the
6 second period is below the absolute value of the discharge firing
7 voltage of the discharge cell.

1 21. The panel display apparatus of Claim 20,
2 wherein a time during which the absolute value of the voltage
3 of the sustain pulse exceeds the absolute value of the discharge
4 firing voltage is no more than 100ns.

1 22. The panel display apparatus of Claim 19,
2 wherein immediately after the trailing edge of the sustain
3 pulse, the driving circuit applies a pulse that is opposite in
4 polarity to the sustain pulse, to the discharge cell for a
5 predetermined period.

1 23. A panel display apparatus for displaying an image in a
2 discharge sustain period, comprising:
3 a gas discharge panel in which a plurality of discharge cells
4 are arranged in the form of matrix between a pair of substrates;
5 and
6 a driving circuit which applies a write pulse to selected
7 discharge cells of the plurality of discharge cells to write the

8 image, and applies at least one sustain pulse to each of the
9 plurality of discharge cells to perform a sustain discharge in
10 the selected discharge cells,

11 wherein immediately after a trailing edge of each sustain
12 pulse which is applied to the discharge cell, the driving circuit
13 applies a pulse that is opposite in polarity to the sustain
14 pulse, to the discharge cell for a predetermined period.

24. The panel display apparatus of Claim 23,
wherein the predetermined period is no more than 100ns.

25. A panel display apparatus comprising:

a gas discharge panel in which a plurality of discharge cells
are arranged between a pair of substrates; and
a driving circuit which (a) applies a write pulse to selected
discharge cells of the plurality of discharge cells to write an
image, and (b) successively applies a plurality of sustain pulses
which alternate in polarity, to each of the plurality of
discharge cells to perform a sustain discharge in the selected
discharge cells,

wherein immediately after a trailing edge of at least a
sustain pulse of the plurality of sustain pulses which is first
applied to the discharge cell, the driving circuit applies a

13 pulse that is opposite in polarity to the sustain pulse, to the
14 discharge cell for a predetermined period.

1 26. The panel display apparatus of Claim 25,
2 wherein the predetermined period is no more than 100ns.

1 27. A panel display apparatus comprising:
2 a gas discharge panel in which a plurality of pairs of first
3 and second electrodes covered with a dielectric are arranged
4 between a pair of substrates; and

5 a driving circuit which accumulates a wall charge on the
6 dielectric to write an image, and applies at least one sustain
7 pulse between each pair of first and second electrodes to perform
8 a sustain discharge in areas where the wall charge has been
9 accumulated,

10 wherein when applying each sustain pulse between the pair of
11 first and second electrodes, the driving circuit
12 applies a first voltage between the pair of first and second
13 electrodes for a fixed period from a leading edge of the sustain
14 pulse, and

15 applies a second voltage between the pair of first and second
16 electrodes for a period from a lapse of the fixed period to a
17 trailing edge of the sustain pulse, the second voltage having a

18 smaller absolute value than the first voltage.

1 28. The panel display apparatus of Claim 27,
2 wherein the driving circuit applies the first and second
3 voltages between the pair of first and second electrodes, by
4 applying two pulses that are same or opposite in polarity and
5 overlap in time, respectively to the first electrode and the
6 second electrode.

1 29. A panel display apparatus comprising:
2 a gas discharge panel in which a plurality of pairs of first
3 and second electrodes covered with a dielectric are arranged
4 between a pair of substrates; and
5 a driving circuit which accumulates a wall charge on the
6 dielectric to write an image, and applies at least one sustain
7 pulse between each pair of first and second electrodes to perform
8 a sustain discharge in areas where the wall charge has been
9 accumulated,
10 wherein immediately after a trailing edge of each sustain
11 pulse which is applied between the pair of first and second
12 electrodes, the driving circuit applies a pulse that is opposite
13 in polarity to the sustain pulse, between the pair of first and
14 second electrodes for a predetermined period.

1 30. The panel display apparatus of Claim 29,
2 wherein the driving circuit applies the sustain pulse and the
3 pulse of the opposite polarity between the pair of first and
4 second electrodes, by applying two pulses that are same in
5 polarity and overlap in time, respectively to the first electrode
6 and the second electrode.

1 31. A driving method for displaying an image in a discharge
2 sustain period in a gas discharge panel in which a plurality of
3 discharge cells are arranged between a pair of substrates,
4 comprising:

5 a writing step for applying a write pulse to selected
6 discharge cells of the plurality of discharge cells to write the
7 image; and

8 a discharge sustaining step for applying at least one sustain
9 pulse to each of the plurality of discharge cells to perform a
10 sustain discharge in the selected discharge cells,

11 wherein in the discharge sustaining step, immediately before
12 a leading edge of each sustain pulse which is applied to the
13 discharge cell, a pulse that is opposite in polarity to the
14 sustain pulse is applied to the discharge cell for a
15 predetermined period.

1 32. A driving method for displaying an image in a discharge
2 sustain period in a gas discharge panel in which a plurality of
3 discharge cells are arranged between a pair of substrates,
4 comprising:

5 a writing step for applying a write pulse to selected
6 discharge cells of the plurality of discharge cells to write the
7 image; and

8 a discharge sustaining step for successively applying a
9 plurality of sustain pulses which alternate in polarity, to each
10 of the plurality of discharge cells to perform a sustain
11 discharge in the selected discharge cells,

12 wherein in the discharge sustaining step, immediately before
13 a leading edge of at least a sustain pulse of the plurality of
14 sustain pulses which is first applied to the discharge cell, a
15 pulse that is opposite in polarity to the sustain pulse is
16 applied to the discharge cell for a predetermined period.

1 33. A driving method for displaying an image in a discharge
2 sustain period in a gas discharge panel in which a plurality of
3 discharge cells are arranged between a pair of substrates,
4 comprising:

5 a writing step for applying a write pulse to selected

6 discharge cells of the plurality of discharge cells to write the
7 image; and

8 a discharge sustaining step for applying at least one sustain
9 pulse to each of the plurality of discharge cells to perform a
10 sustain discharge in the selected discharge cells,

11 wherein in the discharge sustaining step, an absolute value
12 of a voltage of each sustain pulse which is applied to the
13 discharge cell is higher during a first period than a second
14 period, the first period being a fixed period from a leading edge
15 of the sustain pulse, and the second period being a period from
16 a lapse of the fixed period to a trailing edge of the sustain
17 pulse.

18 34. A driving method for displaying an image in a discharge
19 sustain period in a gas discharge panel in which a plurality of
20 discharge cells are arranged between a pair of substrates,
21 comprising:

22 a writing step for applying a write pulse to selected
23 discharge cells of the plurality of discharge cells to write the
24 image; and

25 a discharge sustaining step for applying at least one sustain
26 pulse to each of the plurality of discharge cells to perform a
27 sustain discharge in the selected discharge cells,

11 wherein in the discharge sustaining step, immediately after
12 a trailing edge of each sustain pulse which is applied to the
13 discharge cell, a pulse that is opposite in polarity to the
14 sustain pulse is applied to the discharge cell for a
15 predetermined period.